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A New Species of *Tetralonia* (*Thygatina*) from India, with Notes on the Oriental Fauna (Hymenoptera: Apidae)

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ABSTRACT

A new species of the bee genus *Tetralonia* subgenus *Thygatina* is described and figured from southern India. *Tetralonia* (*Thygatina*) *macroceps*, new species is particularly noteworthy for macrocephaly in males, among other characters. Previously the Oriental fauna of *Thygatina* was thought to consist of a single described species. Aside from *T. (T.) fumida* (Cockerell) and the new species proposed herein, the fauna also includes *T. wickwari* (Bingham), erroneously placed in *Eucara* (as a genus), and herein recognized as a species of *Thygatina*, which is thereby newly transferred to the genus *Tetralonia* (new combination). In addition, there remains at least one additional undescribed species, but owing to confusion surrounding the association of sexes for *T. fumida* and *T. wickwari* this material is left unnamed. The need for additional collecting in southern India and Sri Lanka is stressed in order to resolve this difficulty. Lectotypes and paralectotypes are designated for *T. fumida* and *T. wickwari*.

INTRODUCTION

Thygatina is a small group of eucerine bees confined to peninsular India and Africa south of the Sahara and presently considered a sub-

genus of *Tetralonia* (Michener, 2000). Like other *Tetralonia* (i.e., *Eucara* and *Tetralonia* proper), species of *Thygatina* are small to medium-sized bees with relatively short antennae in the males and in the females sparse

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²Deceased 10 May 2004: Prior to his untimely passing, Dr. Baker had recognized as new the species described herein and prepared line illustrations, without having the opportunity to review the description prepared by the senior author. Thus, the description and text represents the efforts of the senior author, with whom Dr. Baker had been collaborating at the time of his death. Owing to his significant intellectual contribution as well as his preparation of the drawings, Dr. Baker is retained as co-author.

scopae, adapted to carrying large pollen grains. *Eucara* is found only in Africa, with seven species extending as far north as Burkina Faso and Ethiopia, while *Tetralonia* proper is principally palearctic, with one widely distributed, polytypic species [*Tetralonia* (*Tetralonia*) *malvae* (Rossi): southern and central Europe, Levant, east to Iran and Central Asia] and a second in northeastern Africa [*T. (T.) gossypii* Cockerell]. The three groups are generally quite similar; indeed, the distinctions between *Eucara* and *Thygatina* are relatively minor, particularly given that the new species discussed herein is rather *Eucara*-like in character (vide infra). Known pollen sources for the genus include Malvaceae for *Tetralonia* s. str. (genera *Gossypium*, *Lavatera*, *Malva*) and *Eucara* (genus *Gossypium*), as well as Convolvulaceae (genera *Ipomoea*, *Argyrea*) and Malvaceae (genus *Hibiscus*) for *Thygatina*. Species of the genus have a sparse and distinctive metatibial scopa, presumably adapted for the collection of the large pollen grains typical for these plants.

The African species of *Thygatina* were treated by Eardley (1989: as *Tetralonia*), leaving only the Indian taxa unstudied. We herein provide a brief taxonomic summary of the known species of *Thygatina* (table 1), with a particular emphasis on the Indian fauna, and highlight where further collecting and work needs to be undertaken. The Indian species *Tetralonia wickwari* Cockerell was mistakenly referred to *Eucara* (Brooks, 1988) but is herein returned to *Thygatina*. Morphological terminology follows that of Michener (2000) and Engel (2001), while the format for the description generally follows that of Eardley (1989) for African *Thygatina*. Photomicrographs were prepared with a Microptics PhotoImaging System.

SYSTEMATICS

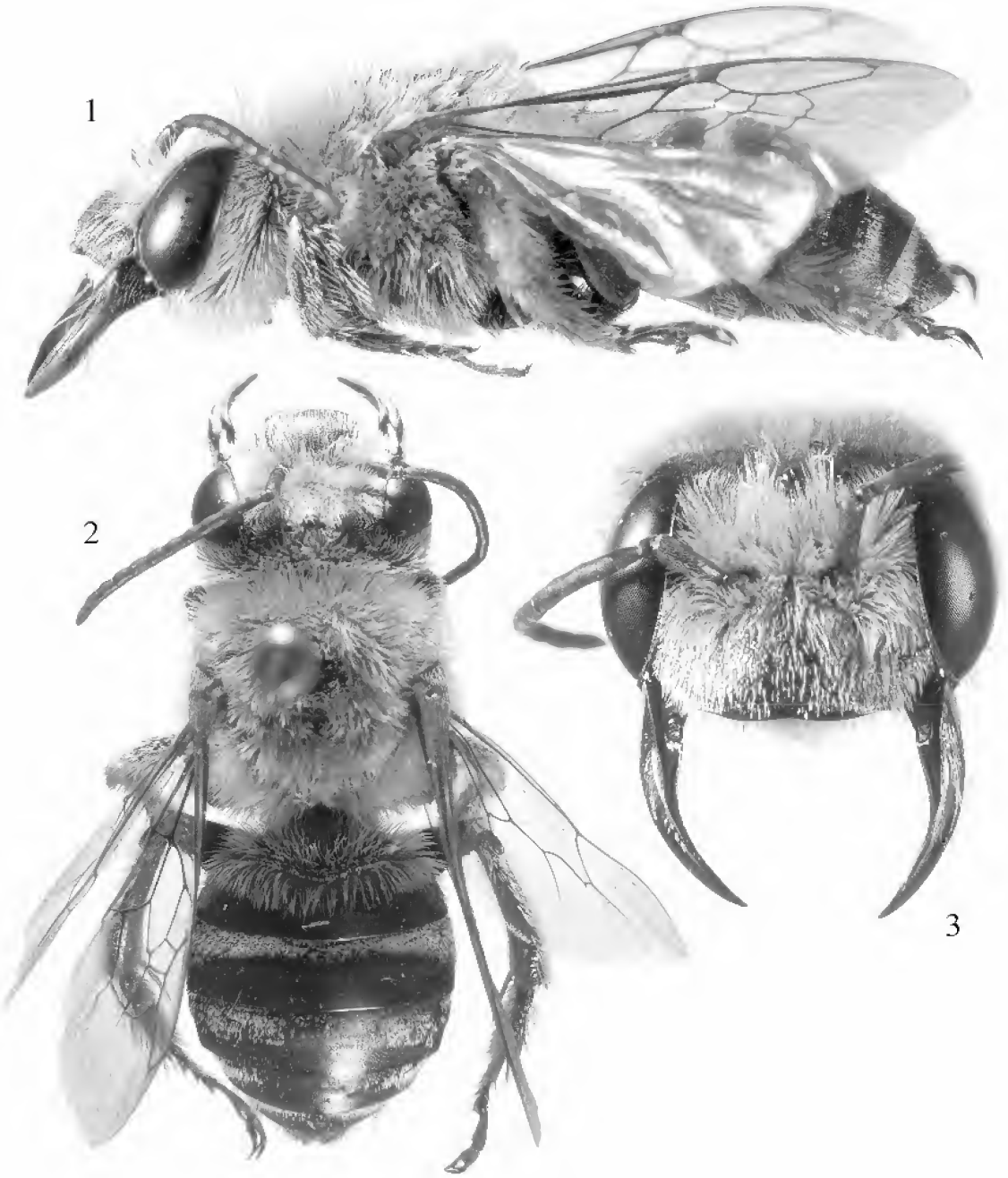
Tetralonia (*Thygatina*) *macroceps*, new species

Figures 1–14

DIAGNOSIS: Males with head strongly transverse and genae broad (figs. 1, 2), inner orbits of compound eyes divergent ventrally (figs. 3, 5); mandibles elongate, falciform

(figs. 1–3, 5); maxillary palpi reduced (fig. 4) (four- or five-segmented in other species); galeae, labial palpi, paraglossae, and glossa all approximately coterminous (i.e., apices reaching to approximately the same point) (fig. 4); antennae short (scarcely as long as twice compound eye length); mesonotal pubescence pale (figs. 1, 2); terminalia as figured (figs. 8–11). Females with head broad, inner orbits divergent ventrally (fig. 14); face with exclusively white pubescence (fig. 14); pale mesonotal pubescence (fig. 13).

DESCRIPTION: As for the genus and subgenus with the following additions: **Male.** Total body length 12.4 mm (11.9–12.4 mm); forewing length 8.3 mm (8.0–8.3 mm). Head strongly transverse [width 4.2 mm (4.0–4.2 mm), length 2.9 mm (2.8–2.9 mm)] distance between inner orbits greater than compound eye length (figs. 3, 5); inner orbits of compound eyes distinctly divergent ventrally (figs. 3, 5); vertex in frontal aspect almost uniformly weakly convex, not depressed between compound eyes and lateral ocelli (fig. 5); gena broad (fig. 1). Antennae short (fig. 2), flagellum scarcely as long as twice compound eye length, scape about one-third compound eye length, distinctly less than combined lengths of first through third flagellomeres (fig. 6); second and third flagellomeres of approximately equal length (fig. 6). Clypeus protuberant, without submarginal fascia (fig. 3); epistomal sulcus obscure medial to anterior tentorial pits except as faint line medially bordering short supraclypeal area (fig. 5). Mandible elongate, flaciform, longer than compound eye length (figs. 1–3, 5). Maxillary palpus short, three-segmented (fig. 4), first palpomere strongly sclerotized, second and third palpomeres (combined length ca. 0.19 mm) weakly sclerotized; galeae, labial palpi, paraglossae, and glossa all approximately coterminous (i.e., apices reaching to approximately the same point) (fig. 4). Intertegular distance 3.1 mm (2.9–3.1 mm). Mesofemur without ventral carina (vide infra); mesotibia slender, with mesotibial spur unmodified (vide infra); mesotarsus elongate, mesobasitarsus long, slender, parallel-sided; metafemur unmodified, without ventral dentition (vide infra); metatibia without process (vide infra); metabasitarsus slen-



Figs. 1–3. Photomicrographs of male holotype of *Tetralonia (Thygatina) macroceps*, new species. 1. Lateral habitus; 2. dorsal habitus; 3. facial view.

der, parallel-sided through its entire length; metatarsomeres II and III distinctly not elongate, similar in length to metatarsomere IV, with abundant pubescence as on sur-

rounding tarsomeres; distitarsi long and strongly arched (fig. 7) (typical in *Thygatina* although less strongly so in most species); pretarsal ungues (claws) with slender, inner

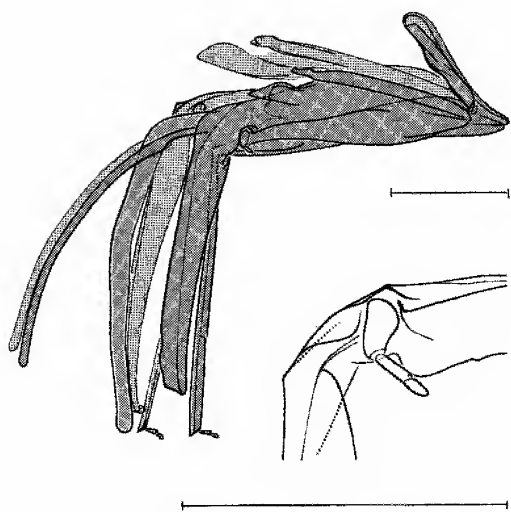


Fig. 4. Labiomaxillary complex and detail of maxilla depicting maxillary palpus of male holotype of *Tetralonia* (*Thyगतina*) *macrocephala*, new species. Scale bars = 1 mm.

tooth. Male terminalia as depicted in figures 8–11.

Integument without markings, generally dark brown except black or nearly so on face, mesosoma, and metasomal terga (except apical margins dark brown); wing veins dark brown, membrane hyaline. Head imbricate with coarse, contiguous or nearly contiguous punctures, punctures more faint on vertex, gena, postgena, apical half of clypeus. Mesosoma imbricate with faint, coarse, contiguous or nearly contiguous punctures; basal area of propodeum rugulose; lateral and posterior surfaces imbricate. Anterior-facing surface of first metasomal tergum smooth, remainder of tergum and remaining terga strongly imbricate with scattered, faint, small punctures except apical margins smooth; metasomal sterna imbricate with scattered minute punctures on central discs except smooth between mediolateral setal patches of fifth sternum.

Vestiture of face white; mandible with ventral brush of long, white setae (fig. 1); vestiture of mesosoma white except off-white dorsally (i.e., white tinged with faint infuscation, although still quite pale); vestiture of legs as on dorsum of mesosoma except infuscation stronger on hind legs, particularly inner surfaces of hind leg podites; vestiture of

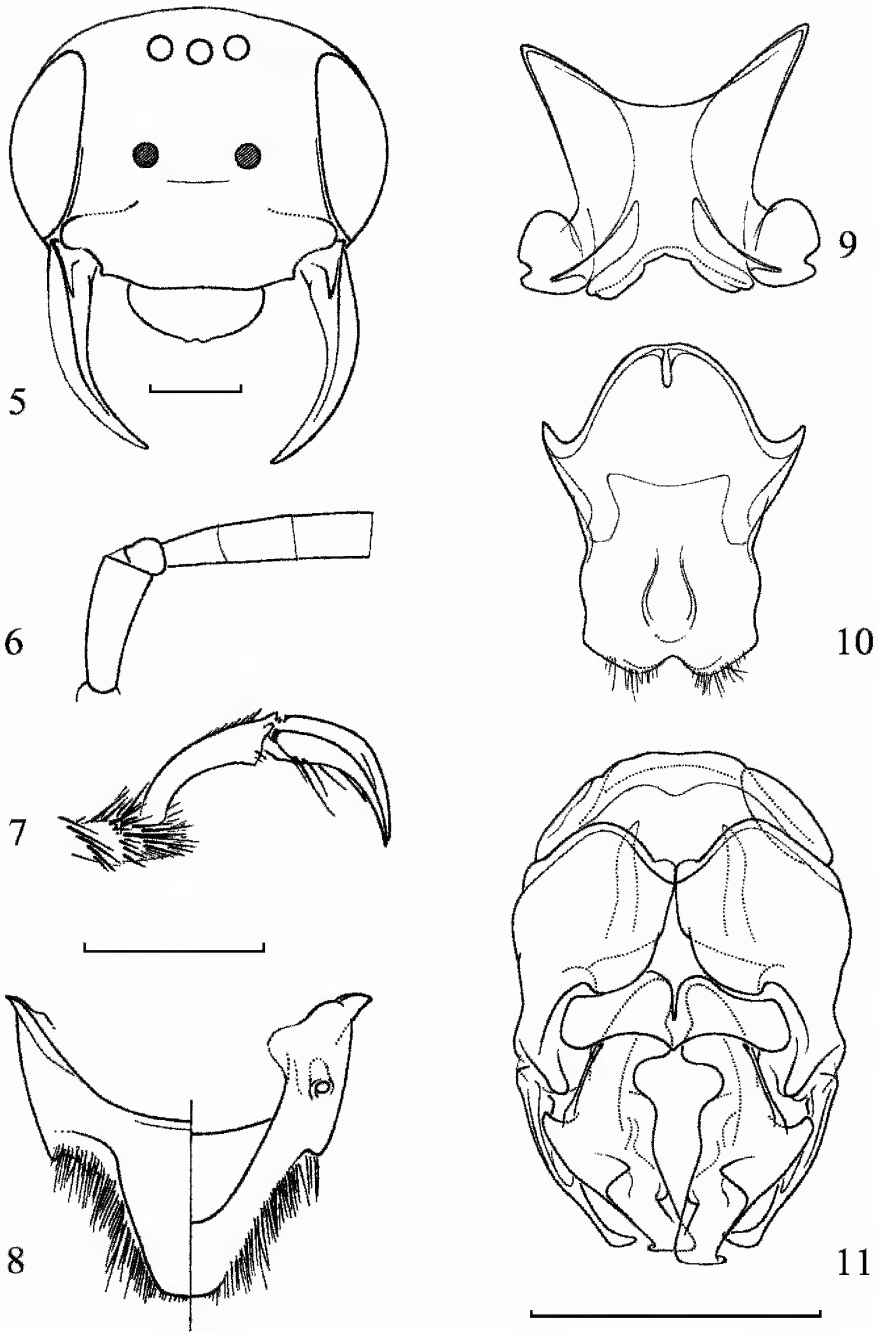
metasoma white except infuscated on setae of seventh metasomal tergum (fig. 8); anterior-facing surface of T1 abundantly covered with elongate, plumose, white setae; metasomal terga II–V with white, tomentose bands in basal halves, such bands weaker on third and fourth terga (fig. 2); fifth metasomal sternum with subapical, mediolateral patches of dense black setae.

Female. As described for the male aside from usual sexual differences and with the following minor emendations: total body length 11.6 mm (11–11.8 mm); forewing length 7.6 mm (6.9–7.8 mm). Head broad [width 3.9 mm (3.7–4.0 mm), length 2.6 mm (2.6–2.7 mm)]; lower distance between inner orbits of compound eyes greater than length of compound eye, upper distance between inner orbits of compound eyes about as long as length of compound eye. Mandible about as long as compound eye, outer apical half sometimes amber colored, apex minutely notched (appearing bluntly rounded in worn specimens). Intertegular distance 3.0 mm (2.9–3.2 mm). Pygidial plate acutely rounded at apex, lateral margins gently convex and tapering in apical half to apex; surface minutely and transversely striate.

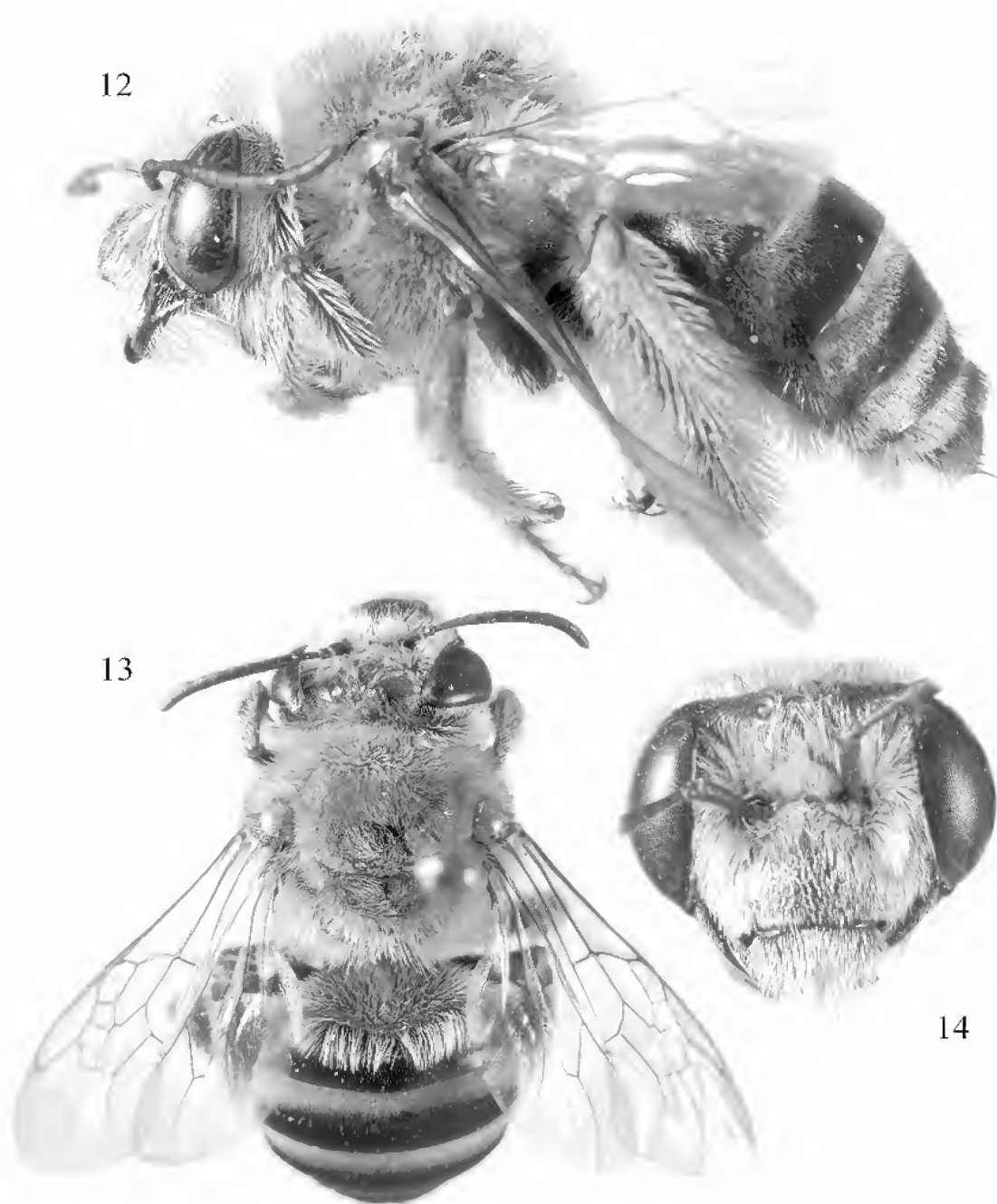
Scopal setae fuscous; white, tomentose bands of metasomal terga II–V stronger than those of male (figs. 12, 13); apical fimbriae of fifth and sixth metasomal terga fuscous except laterally white on fifth tergum; sterna with transverse apical brushes of dense, fuscous setae.

HOLOTYPE: Male, labeled “South India: Madras State, Coimbatore, vii 1957, P. Susai Nathan”. The holotype is in the Donald and Madge Baker Collection, Division of Entomology, University of Kansas Natural History Museum.

PARATYPES: One female labeled “S. India: Madras State, Coimbatore, 1400 ft., viii 1971, T.R.S. Nathan”; two males, two females labeled “India: Tamil Nadu, Mudumalai Preserve, 1200 m, 30 km NW Udagamandalam (= Ooty), 16 August 1990, Charles D. Michener, ex: *Argerria cuneata* [for *Argyria cuneata* Ker-Gawl., Convolvulaceae]”; one male, three females labeled “India: Tamil Nadu, Mudumalai Preserve, 1100 m, 30 km NW Udagamandalam (= Ooty), 16 August



Figs. 5–11. Holotype male of *Tetralonia* (*Thygatina*) *macrocephala*, new species. **5.** Facial view; **6.** base of antenna showing scape, pedicel, and first three flagellomeres; **7.** metapretarsus; **8.** seventh metasomal tergum (left half is dorsal, right half is ventral); **9.** seventh metasomal sternum; **10.** eighth metasomal sternum; **11.** genitalic capsule. Scale bars = 1 mm (bar between mandibles for fig. 5; bar beneath distitarsus for figs. 6–8; bar at bottom of right column for figs. 9–11).



Figs. 12–14. Photomicrographs of female of *Tetralonia (Thygatina) macroceps*, new species. 12. Lateral habitus; 13. dorsal habitus; 14. facial view.

1990, Charles D. Michener, *ex*: *Argerria cuneata* [for *Argyreia cuneata* Ker-Gawl., Convolvulaceae]; one male labeled “India: Tamil Nadu, 5 km S Theppakadu, Mu-

dumalai Preserve, 1–3 August 1990, William T. Wcislo”; one male labeled “India: Tamil Nadu, Mudumalai Preserve, Centre for Ecological Studies, 4 August 1990, William

T. Wcislo". All paratypes are in the Division of Entomology, University of Kansas Natural History Museum (the specimen collected by Nathan is in the Donald and Madge Baker Collection, the remainder is in the Snow Entomological Collection).

ETYMOLOGY: The specific epithet is a reference to the enlarged head, particularly of males, in this species.

FLORAL RECORDS: Males and females of this species have been collected at flowers of *Argyreia cuneata* Ker-Gawl. (Convolvulaceae).

COMMENTS: The head structure of *T. macroceps* is quite *Eucara*-like in character; i.e., the head is broad and the compound eyes are diverging ventrally (figs. 3, 5). Indeed, the overall shape of the head is quite similar to *T. (Eucara) macrognatha* (Gerstäcker), widely distributed in Africa [material from Zimbabwe (labeled "S. Rhodesia") examined], or *T. (E.) penicillata* (Fries) from central East Africa (material from Abyssinia examined). The new species otherwise embodies all of the defining features for *Thygatina*. The validity of the current subgeneric system for *Tetralonia* should be critically reevaluated.

Tetralonia macroceps can be distinguished from *T. wickwari* (Bingham), the only other named Oriental species known in the male sex, by the following features (those of *T. wickwari* mentioned, with alternates for *T. macroceps* in parentheses): clypeus with narrow, submarginal yellow fascia (such fascia absent in *T. macroceps*: fig. 3); second flagellomere less than half length of third flagellomere (second and third flagellomeres of approximately equal lengths in *T. macroceps*: fig. 6); head strongly transverse, except inner orbits not conspicuously divergent ventrally (inner orbits divergent in *T. macroceps*: figs. 3, 5); mesofemur deeply, ventrally carinate, carina abruptly, arcuately contracted basally (mesofemur without ventral carina in *T. macroceps*); mesotibia expanded apically, with mesotibial spur unguiform (slender and unmodified, with mesotibial spur unmodified in *T. macroceps*); metafemur ventrally strongly dentate basally (metafemur unmodified, without ventral dentition in *T. macroceps*); metatibia at apex ventrally with strong, apically-truncate, denticiform process (such a process absent in *T.*

macroceps); metabasitarsus slender basally, strongly expanded apically (metabasitarsus slender, parallel-sided through its entire length in *T. macroceps*); metatarsomeres II and III elongate, weakly pubescent (metatarsomeres II and III distinctly not elongate, similar in length to metatarsomere IV, with abundant pubescence as on surrounding tarsomeres in *T. macroceps*).

The female differs from *T. fumida* (Cockerell), known only in the female sex, by the divergent compound eyes (parallel in *T. fumida*); the supraclypeal area with exclusively white setae (strongly intermingled with black setae in *T. fumida*); the vertex with white setae, a few with slight infuscation (nearly all setae black on vertex in *T. fumida*); the wing membrane hyaline (strongly infuscated in *T. fumida*); and the tomentose bands strong and wide on the second through fifth metasomal terga (tomentose bands of metasoma weak on second through fourth metasomal terga, nearly absent on fifth metasomal tergum in *T. fumida*).

Tetralonia (Thygatina) wickwari
(Bingham), new combination

Podalirius wickwari Bingham In Wickwar, 1908: 122.

Eucara wickwari (Bingham): Brooks, 1988: 575.

LECTOTYPE: A male labeled "Columbo / Ceylon / 3-06 [March 1906] / O. Wickwar" and "Podalirius / wickwari ♂ / Bingham Type" in the Natural History Museum, London (B.M. Type Hym 17b641) (here designated).

PARALECTOTYPE: A male with identical labels as that of the lectotype (here designated). The paralectotype had been crudely dissected and is much broken (the labrum, mouthparts, and anterior legs are glued on a piece of card).

Tetralonia (Thygatina) fumida (Cockerell)

Thygatina fumida Cockerell, 1911: 237.

Tetralonia (Thygatina) fumida (Cockerell): Michener, 2000: 716 (although Michener did not explicitly propose the new combination of the epithet *fumida* with *Tetralonia*, he can be considered as having done so automatically in his

TABLE 1
Species of *Thygatina*

Species	Genders known	Distribution
—ETHIOPIAN REGION—		
<i>Tetralonia (Thygatina) cinctula</i> Cockerell ^a	♂♀	Kenya, Botswana, southwest Africa
<i>Tetralonia (Thygatina) fraterna</i> Friese	♂♀	western and southern Africa
<i>Tetralonia (Thygatina) labrosa</i> Friese	♂	Kenya
<i>Tetralonia (Thygatina) nigropilosa</i> Friese	♂♀	sub-Saharan Africa
<i>Tetralonia (Thygatina) obscuriceps</i> Friese	♂♀	sub-Saharan Africa
<i>Tetralonia (Thygatina) obscuripes</i> Friese ^a	♀	Tanzania
—ORIENTAL REGION—		
<i>Tetralonia (Thygatina) fumida</i> (Cockerell)	♀	southern India, Sri Lanka
<i>Tetralonia (Thygatina) macrocephs</i> , n.sp.	♂♀	southern India
<i>Tetralonia (Thygatina) wickwari</i> (Bingham)	♂	Sri Lanka
<i>Tetralonia (Thygatina)</i> sp.	♂	<i>vide</i> Discussion

^a*Tetralonia (Thygatina) trichardti* Cockerell, known only from three females from Transvaal, is likely synonymous with one of these two species (*T. cinctula* Cockerell or *T. obscuripes* Friese), both of which it has priority over.

placement of *Thygatina* as a subgenus of *Tetralonia* given that *T. fumida* is the type species for the former).

LECTOTYPE: A female labeled “Kandy / Ceylon / February [19]10 / E. Comber” in the Natural History Museum, London (here designated).

PARALECTOTYPE: A female labeled “Ceylon. / Kandy. / B.1. [19]08 / O.S. Wickwar” in the Natural History Museum, London (here designated). The paralectotype has the mouth-parts removed and is accompanied by a note reading, “I found these tunneling in a bank and storing their nest with pollen. The tunnel went into the bank about 8–10 inches. Kandy. Ceylon. Jan: 08. O.S.W. [O.S. Wickwar].”

DISCUSSION

There is at least one additional species in the Oriental fauna that we have chosen not to describe. The dilemma rests on the fact that there are two undescribed males in this region—one from southern India, the other from Sri Lanka—and either could be the yet unknown male for *T. fumida*. *Tetralonia fumida* is known only from females occurring in southern India and Sri Lanka (table 1). The Sri Lankan species *T. wickwari*, known only from males (table 1), and an undescribed male from this same island agree well with *T. fumida*, yet each form of male is specifically distinct. Either *T. wickwari* is the male and thereby a senior synonym of *T. fumida*

(leaving the other Sri Lankan male as an undescribed species), or the undescribed male is the unrecognized mate of *T. fumida*. The matter is further complicated in that a third, specifically distinct male is known from the mainland in southern India. Since *T. fumida* is known to occur in both Sri Lanka and southern India, this third form could alternatively be the long-lost male for the species. Should this scenario prove to be true, the female of *T. wickwari* would remain undiscovered and the second Sri Lankan male would represent an undescribed species. Regardless, there is either a new species in southern India or in Sri Lanka. That *T. wickwari* and *T. fumida* are synonyms and that both unassociated males are new is a remote possibility. Until males and females are captured together (ideally in copula), thereby revealing which is the new species and which is the male for *T. fumida*, it is prudent to hesitate naming these forms. More intensified collecting in the region is required to resolve this issue.

A specimen of the potentially new southern Indian male is in the Donald and Madge Baker Collection, Division of Entomology, University of Kansas Natural History Museum. The specimen is labeled “South India: Nilgri Hills, Cherangode, 3500 ft, xi 1950, P.S. Nathan”. A specimen of the potentially new Sri Lankan male is in the Natural History Museum, London, labeled “Colombo, Ceylon, O.S.W. 6.08” //

“Ceylon, O.S.W. 6.08. O.S. Wickwar. 1912–189”. The Ceylonese male is similar to the peninsular male but differs by the inner orbits of the compound eyes being conspicuously divergent, the metatarsi less elongate and slender, and metatarsomeres II and III short and conspicuously pubescent, especially apically and dorsally. Additionally, the Ceylonese male has the metabasitarsus parallel-sided, the clypeus dark, the labrum testaceous, the second flagellomere half as long as the third flagellomere, and the fifth metasomal sternum between the lateral tufts of setae being glossy and devoid of macrosculpture.

ACKNOWLEDGMENTS

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